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REMARKS

The Examiner rejected Claims 1-11 and 13-22 under 35 U.S.C. 102(b) as being anticipated by Zhu (of record). Applicant traverses this rejection.

The Examiner has the burden of showing by reference to the cited art each claim limitation in the reference. Anticipation under 35 U.S.C. 102 requires that each element of the claim in issue be found either expressly or inherently in a single prior art reference. In re King, 231 USPQ 136, 138 (Fed. Cir. 1986); Kalman v. Kimberly-Clark Corp., 218 USPQ 781, 789 (Fed. Cir. 1983). The mere fact that a certain thing may result from a given set of circumstances is not sufficient to sustain a rejection for anticipation. *Ex parte Skinner*, 2 USPQ2d 1788, 1789 (BdPatApp&Int 1986). "When the PTO asserts that there is an explicit or implicit teaching or suggestion in the prior art, it must indicate where such a teaching or suggestion appears in the reference" (*In re* Rijckaert, 28 USPQ2d, 1955, 1957).

Claim 1 requires a detector signal related to the power of the radiation leaving a quantum absorber to exhibit an asymmetry as a function of modulation frequency about ν_0. In addition, Claim 1 requires a servo loop that alters one of ν_L, said first CPT component amplitude, and said second CPT component amplitude in a manner that reduces said asymmetry.

The Examiner points to Zhu as providing these teachings. Specifically, the Examiner points to Figure 5D and the passage at column 12, lines 11-28 as supporting the proposition that the detector in Zhu exhibits an asymmetry that satisfies the limitations of the claim. Applicant must disagree. First, Figure 5D is a plot of the Stark shift as a function of modulation index. This is not a plot of the output of the detector as a function of frequency.

Second the cited passage at col. 12, lines 18-28 teaches that there is a possibility of a laser generating frequency components having intensities that are asymmetrical about the ν_L frequency. Zhu goes on to teach that if this occurs, a different modulation index is chosen to illuminate this asymmetry. The modulation index is fixed, and hence, there is no servo loop. During the operation of the device, the asymmetry referenced by the Examiner does not exist.

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Hence, there is no teaching that the output of the detector is asymmetrical about the center modulation frequency, ν_0.

Furthermore, the Examiner has not pointed to any teaching in Zhu that there is a servo loop that alters one of ν_L, said first CPT component amplitude, and said second CPT component amplitude in a manner that reduces said asymmetry, or any other asymmetry. Zhu teaches that the modulation index is set to a particular value that remains constant throughout the operation of the device. Zhu also teaches that a different constant value should be used if the asymmetry in the spectrum referenced by the Examiner occurs to remove that asymmetry. There is no teaching of a servo loop for reducing such an asymmetry, no less the asymmetry recited in Claim 1. Accordingly, Zhu could not anticipate Claim 1 or the claims dependent therefrom.

With respect to Claim 3, Applicant submits there is no teaching in Zhu that the laser frequency, ν_L, is altered in response to any asymmetry, no less the asymmetry of the detector signal. Hence, there are additional grounds for allowing Claim 3.

Claim 6 requires that the modulator that modulates the EM radiation, i.e., the laser, also modulates the phase of the radiation or both the phase and amplitude of the radiation. The Examiner points to modulator 260 shown in Zhu as satisfying this limitation. Applicant disagrees. Zhu teaches only that this modulator modulates the intensity of the laser, not both the intensity and frequency. Hence, there are additional grounds for allowing Claim 6.

Claim 13 requires the generation of a detector signal related to the power of the radiation leaving a quantum absorber, with that signal exhibiting an asymmetry as a function of modulation frequency about ν_0. In addition, Claim 13 requires the alteration of one of ν_L, said first CPT component amplitude, and said second CPT component amplitude in a manner that reduces said asymmetry.

The Examiner points to Zhu as providing these teachings. Applicant disagrees. Applicant repeats the arguments made above with respect to Claim 1. First, there is no teaching in Zhu that the output of the detector is asymmetrical about the center modulation

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frequency, ν_0. Second, there is no teaching in Zhu that one of ν_L, said first CPT component amplitude, and said second CPT component amplitude is altered in a manner that reduces said asymmetry, or any other asymmetry.

The Examiner also pointed to teachings in Zhu (col. 15, lines 8-19) that show how a Stark shift detector [261 of Fig. 7] in conjunction with spectrum controller [214] can "modify the spectrum of the incident light to one that minimizes the magnitude of the total AC Stark shift". The Examiner suggests that these teachings anticipate Claims 1 and 13 in that they disclose reducing the asymmetry of the detector signal intensity about the carrier frequency by nature of reducing AC Stark shift. Applicant must disagree with this argument.

First, for this argument to be relevant to the limitations of Claims 1 and 13, the Examiner must be arguing that by reducing the AC Stark shift, one reduces asymmetry in the detector signal as a function of frequency about ν_0. The AC Stark shift is the dependence of the separation of the two CPT states on the intensity of the light applied to the absorber. The Examiner has not pointed to any teaching in the art that there is a coupling between this dependence and an asymmetry in the detector signal of the type claimed in Claims 1 and 13. Accordingly, Zhu does not anticipate all the limitations of Claim 13 or the claims dependent therefrom.

The Examiner rejected Claims 12 and 23 under 35 U.S.C. 103(a) as being unpatentable over Zhu. Applicant traverses this rejection.

First, Applicant repeats the arguments made above with respect to Claims 1 and 13 regarding the missing teachings in Zhu concerning asymmetry in the detector signal and a means of reducing that asymmetry. The Examiner has not pointed to any teaching in Zhu that suggests altering Zhu to provide these missing teachings.

Second, the Examiner admits that Zhu does not disclose the selection of an isotope selected from the groups recited in Claims 12 and 23. The Examiner attempts to overcome this problem by pointing to the suggestion in Zhu (col. 12, lines 48-60) that Cesium, Rubidium, any other alkali metal, or any other suitable atoms, ions or molecules may be used in the quantum absorber. The Examiner states that since the ions claimed are from group IIA

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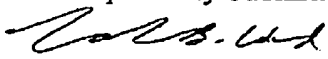
and IIB of the periodic table, these elements would be expected to have similar properties to the alkali metals of group IA of the periodic table. Applicant disagrees with the Examiner's assertion that one of ordinary skill in the art would recognize that the elements from two different groups in the periodic table would perform similar functions in an atomic frequency standard, and that choosing an element from group II would be an obvious alternative to choosing an element from group IA, as taught by Zhu. The elements in the periodic table are grouped by the chemical behavior of the elements. This involves similarities in the electron configurations in the outer shell of electrons. Hence, one would not normally substitute elements from one group for elements of another group unless there is some similarity in the chemical property that is common to all members of both groups. First, The Examiner has not pointed to any relevant chemical property shared by both group I and group II elements that would cause someone to make the substitution.

Second, the CPT effect involves energy levels that are not necessarily associated with these outer electrons. Hence, the chemical similarities do not necessarily provide any insight with respect to the elements to be used in a CPT frequency standard. Accordingly, Applicant submits that the Examiner has not made a *primia facia* case for obviousness with respect to Claims 12 and 23, and there are additional grounds for allowing Claims 12 and 23.

I hereby certify that this paper is being sent by FAX to 571-273-8300.

Respectfully Submitted,



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